Appendix C: Comparison between the 2003 Sun-Earth Connection Roadmap and the 2002 Solar and Space Physics Decadal Survey

The 2003 SEC Roadmap Report and the 2002 Solar and Space Physics Decadal Survey Report (The Sun to the Earth and Beyond: A Decadal Research Strategy in Solar and Space Physics) were developed independently. There were no members of the main Decadal Survey Panel that were also members of the Roadmap team. Furthermore, because of National Research Council requirements, the Decadal Survey report remained confidential until August 2002, when the Roadmap report was in its final stages of development. Nevertheless, there were several Roadmap team members that were also members of the various sub-panels of the Decadal Survey. Thus, overlap was inevitable between the two reports.

Although overlap was expected, it was also expected that the Roadmap and Decadal Survey reports should have some differences. After all, the Roadmap report focuses on Sun-Earth Connection research conducted through strategic missions over an extended interval whereas the Decadal Survey report has a much broader audience including the National Science Foundation, NOAA, and the Department of Defense. The following compares those elements of the Roadmap and Decadal Survey that are similar, but use different terminology. This comparison is intended to illustrate that the two reports are similar when the parts of the Decadal Survey that pertain to the Sun- Earth Connection Division are considered.

Science Issues

Both the Roadmap and Decadal Survey describe "science objectives" for the "coming decade and beyond". That is, the Decadal Survey recognizes that the objectives listed in its executive summary are multi-decadal, similar to the Roadmap science objectives. In the Roadmap, these objectives are called Primary Science Objectives, while in the Decadal Survey, they are called Science Challenges. The Roadmap Primary Science Objectives are further divided into Research Focus Areas, which are approximately decadal in duration. When compared side-by-side as in Table C1, it is apparent that the Science Objectives and Research Focus Areas in the Roadmap and the Science Challenges in the Decadal Survey are very similar. In particular, the first three Science Challenges of the Decadal Survey and the first three research focus areas of the Roadmap are very similar. The next two Science Challenges in the Decadal Survey are similar to the second and third Science Objectives in the Roadmap. The most significant difference between the Science Challenges and the Roadmap objectives is in the fifth Challenge and third Science Objective in Table C1. The Roadmap Science Objective focuses on the targeted basic research in the Living With a Star program that will lead to an understanding of the impacts of variability in the Sun-Earth connection. The Decadal Survey Science Challenge goes further to develop near-real-time predictive capability for understanding the impacts of variability in the Sun-Earth connection. This difference reflects the broader institutional nature of the Decadal Survey when compared to the Roadmap. In the Decadal Survey, the Science Challenges extend to other government institutions such as NOAA, which has typically had the responsibility of developing and maintaining "operational" space missions (e.g., the GOES spacecraft). In contrast, the Roadmap is focused on the Science Objectives of the Sun-Earth Connection Division, which does not typically have responsibility over "operational" space missions.

Table C1. Comparison of the Roadmap Primary Science Objectives and Research Focus Areas and the Decadal Survey Science Challenges.

2003 SEC Roadmap Primary Science Objectives	2003 SEC Roadmap Research Focus Areas	2002 Solar and Space Physics Decadal Survey Science Challenges
Understand the changing flow of energy and matter throughout the Sun, heliosphere, and planetary environments.	- Understand the structure and dynamics of the Sun and solar wind and the origins of magnetic variability. - Determine the evolution of the heliosphere and its interaction with the galaxy. - Understand the response of magnetospheres and atmospheres to external and internal drivers.	1. Understanding the structure and dynamics of the Sun's interior, the generation of solar magnetic fields, the origin of the solar cycle, the causes of solar activity, and the structure and dynamics of the corona 2. Understanding heliospheric structure, the distribution of magnetic fields and matter throughout the solar system, and the interaction of the solar atmosphere with the local interstellar medium 3. Understanding the space environments of Earth and other solar system bodies and their dynamical response to external and internal influences
Explore the fundamental physical processes of space plasma systems.	- Discover how magnetic fields are created and evolve and how charged particles are accelerated. - Understand coupling across multiple scale lengths and its generality in plasma systems.	4. Understanding the basic physical principles manifest in processes observed in solar and space plasmas
Define the origins and societal impacts of variability in the Sun-Earth connection.	- Develop the capability to predict solar activity and the evolution of solar disturbances as they propagate in the heliosphere and affect the Earth - Specify and enable prediction of changes to the Earth's radiation environment, ionosphere, and upper atmosphere. - Understand the role of solar variability in driving space climate and global change in the Earth's atmosphere.	5. Developing near-real-time predictive capability for understanding and quantifying the impact on human activities of dynamical processes at the Sun, in the interplanetary medium, and in the Earth's magnetosphere.

Mission Issues

Nearly all of the missions in the Decadal Survey are found in the Roadmap under the same name. The Decadal Survey lists missions in priority order. Such a prioritization is not done in the roadmap. Furthermore, the Decadal Survey considers missions from a variety of sources in its prioritization. Thus, there are some differences in the Decadal Survey and Roadmap missions. These differences are delineated in Table C2. Aside from name changes, there are few differences in the missions. One exception is the Stereo Magnetospheric Imager (last row in Table C2) and the Geospace System Response Imager (GSRI). GSRI incorporates elements of the Stereo Magnetospheric Imager mission in its mission design; however, these two missions are different.

Finally, there are several missions in the Roadmap that do not appear in the Decadal Survey. This difference should not be surprising considering that the Decadal Survey has a much shorter time horizon than the Roadmap. The placement of the missions in the two reports is also somewhat different. The Roadmap missions are placed in three categories (near-, intermediate-, and long-term) based on the start of mission phase C/D. In contrast, the Decadal Survey discusses missions with launch dates within the next decade.

Table C2. Comparison of Missions in the Roadmap and Decadal Survey.

Roadmap Mission	Decadal Survey Mission	Comments
Solar Probe	Solar Probe	Both the Roadmap and Decadal Survey recognize this as a "large" mission of high importance.
Magnetospheric Multiscale	Magnetospheric Multiscale	Identical in the two reports
Radiation Belt Storm Probes/ Ionosphere Thermosphere Storm Probes	Geospace Network	Identical missions in the two reports, only differences in the names
Jupiter Polar Orbiter (JPO)	Jupiter Polar Mission	Essentially identical missions in the two reports, with slightly different names
Inner Heliosphere Sentinels (IHS)	Multi-spacecraft Heliospheric Mission	Nearly identical missions in the two reports, only differences in the names
Geospace Electrodynamic Connections (GEC)	Geospace Electrodynamic Connections (GEC)	Identical in the two reports
Magnetospheric Constellation (MC)	Magnetospheric Constellation	Identical in the two reports
L-1 Diamond	Solar Wind Sentinels	Similar missions in the two reports (differing in the number of spacecraft)
Geospace System Response Imager (GSRI)	Stereo Magnetospheric Imager (SMI)	GSRI incorporates some of the elements of SMI, but these missions are different